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MEETING REPORTS

Logging-Wildlife Interactions in Managed Tropical Forests

An international workshop held in Santa Cruz, Bolivia, during 13–15 November 1996

Hosted by the Wildlife Conservation Society (WCS), New York, NY, USA and the Sustainable Forestry Management Project (BOLFOR), this workshop was organized to evaluate current understanding of the interactions between wildlife and timber production in the tropics, and the implications for sustainable forest management. In a mixed forum, foresters, wildlife biologists, resource managers, and policy makers, reviewed the importance of wildlife as a component of production forests, and the ways in which conventional logging practices impact their populations. Discussions focused on clarifying: the reasons for conserving wildlife in production forests; the methods needed to evaluate timber harvesting-wildlife interactions; current techniques to reduce silvicultural impacts on biodiversity; the role of natural forest management and certification programs in biodiversity conservation; and where research and management efforts should be focused in the future.

Protected areas in the tropics are currently inadequate to protect the biological diversity characterizing this region, owing to their limited size, number, distribution, and composition. Within forested landscapes, production forests may contain significant biodiversity not found within totally protected areas. In many countries, the large size and varied habitats of these forests can complement the existing system of reserves, and taken as part of the landscape, can make significant contributions to biodiversity conservation. Current exploitation trends and practices within production forests, however, have direct and indirect positive and negative impacts on many plant and animal species. Steps must be taken to improve our understanding of the effects of management practices on biological diversity, ways to mitigate negative aspects associated with them, and where our efforts should focus in the future to achieve ecological and economic sustainability of our natural resources.

The workshop came to the following conclusions. Biological diversity is important for maintaining the long-term health and productivity of natural forests, but we do not understand or appreciate the roles that all organisms play in this process. Prudence suggests that efforts must be made to maintain suitable habitat for these organisms within major forest types. Production forests that are carefully managed for timber and non-timber forest products (NTFP) can significantly contribute to the conservation of biodiversity at the stand and landscape levels.

There are a few tropical forests carefully managed for their long-term productivity and ecological integrity, with current timber harvesting practices in most areas having direct and indirect negative impacts on the biodiversity of these forests. While economic incentives and government policies have begun slowly to shift this trend of forest exploitation towards sustainable forest management, most timber harvesting practices for the foreseeable future will continue to degrade the biological quality of production forests.

Basic techniques exist to evaluate the impacts of timber harvesting practices on biodiversity. A two-tiered approach to biodiversity inventory and monitoring, using longitudinal (pre-/post-treatment) multi-taxonomic studies at the landscape level, and evaluations of rare, threatened, and exploited species (plant and animal) at the stand or management unit (i.e. concession) level, is suited to providing resource planners and managers with feedback on their management prescriptions.

All forest management activities impact biodiversity, however basic techniques exist to mitigate many of the negative impacts associated with silvicultural practices. Careful implementation of reduced logging impact (RLI) measures can help to lower the direct and indirect impacts of these activities on native fauna and flora communities (minimizing roads, directional felling, control of hunting, etc.), thus helping to conserve biological diversity.

Stream corridors and steep sloping sites within concessions should be withdrawn from harvesting activities, given their importance in protecting water and soil resources, and their apparently high value as forested corridors and wildlife habitat. In addition to these sites, 10% or more of the proposed cut area should be considered for reserve status, as these uncut parcels create refuges from which animals and plants disturbed by silvicultural activities can eventually recolonize and stabilize the post-treatment area, from both ecological and economic standpoints.

Research is still needed to refine the above mentioned techniques, with priority topics including clarifying the role of keystone/indicator species within logged and unlogged landscapes; assessing site-specific impacts of silvicultural practices on stand structure and composition, including harvesting systems and intermediate practices; determining the size, shape, distribution, value and percentage of reserve areas within actively managed landscapes (i.e. large contiguous block versus many small parcels linked by corridors); identifying similarities/dissimilarities between natural disturbance events and silvicultural practices; locating gazetted tropical production forests onto GIS maps that identify the biodiversity values of these forests; and establishing rotation lengths and recovery periods for major forest types that maintain both ecological health of the resource and economic viability of the management operation.

In many areas of the tropics 'cultural' changes are required before forest managers will be in a position to implement practices that effectively reduce ecological impacts while maintaining the economic viability of silvicultural treatments. Steps to overcome these obstacles include: supporting continued improvement and expansion of RLI systems that demonstrate real promise for reducing harvesting impacts and costs; identifying and disseminating knowledge about tax incentives and other government policies that promote reinvestments into sustainable forestry by both the public and private forestry sectors, developing and expanding certification programmes that can provide both financial and non-financial incentives for ecologically-sound management in production forests, involving all stakeholders (foresters, wildlife managers, concession holders, researchers, policy makers, local communities, etc.) in the design, application, and betterment, of natural forest management practices; convening working sessions where foresters, concession holders, researchers, and the general public together can share ideas regarding the value of biodiversity to the forest and their respective interests, and measures that might be undertaken to protect these assets; strengthening laws and the enforcement capacity of government agencies that protect and promote biodiversity conservation and sustainable forest management efforts, including the gazetting

of additional reserves and production forests; developing and broadly disseminating practical manuals, public education materials and applied training programmes focused on how effectively to incorporate the conservation of biological resources into commercial forest management, targeting audiences such as public and private sector forestry specialists, loggers, wildlife managers, environmental groups, and the general public.

In many production forests, reducing harvesting impacts and regenerating commercial timber species for a long-term yield of timber, offer the best hope of retaining forest cover and the habitat it creates for the native fauna and flora. However, in other areas biodiversity may best be conserved by other means, including gazetting the forest for other purposes such as NTFP production, low impact recreation, ecological research, watershed protection or some mix of these low-intensity, resource-use activities. A central challenge for donors, policy makers, conservation biologists and foresters is to identify and adopt the most effective means to conserve biodiversity in forest landscapes including production and protected forest areas.

By early 1998 WCS will have completed an edited volume, containing 28 chapters addressing logging-wildlife issues in the tropics. For additional information on this book, the multi-lingual working paper being developed from the workshop sessions, and/or other aspects of the WCS forestry programme, please contact Dr Robert A. Fimbel at the address below.

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Saving Biodiversity in the United States: A Conference for Wildlife Advocates

Held at the Catholic University, Washington, DC, during 7–10 February 1997

This conference was presented by Defenders of Wildlife (Washington, DC), the Center for Wildlife Law (University of New Mexico, Albuquerque), and the Grassroots Environmental Effectiveness Network (Washington, DC), in conjunction with the Endangered Species Coalition (Washington, DC). The conference was funded in large part by the Geraldine R. Dodge Foundation (Morristown, New Jersey), and was inspired by the findings in a report by Defenders of Wildlife and the Center for Wildlife Law entitled 'Saving Biodiversity: A Status Report on State Laws, Policies and Programs'. A total of 30 speakers, panelists and presenters from all over the USA, ranging from state agency staff to environmental organizations, participated in the conference.

The conference brought together representatives from grassroots environmental organizations, state wildlife and natural resource agencies, and environmental grant-making foundations, as well as students, scholars and other interested individuals from across the nation. Despite a severe winter storm, attendance at the conference totalled over 200, and participants came from as far away as Alaska, Canada and California. The goals of the conference were twofold: to bring participants up to date on strategies and plans for reauthorization of the federal Endangered Species Act, and to bring to light current state efforts underway to protect biodiversity in the United States. To this end, one full day was devoted to each goal, although emphasis was placed throughout on the states' role in saving biodiversity, even under federal law. The last day of the conference was devoted to activist training so that participants could put into action both, in Washington and at home, strategies and ideas for programmes and policies learned about during the conference.

The conference began on the Friday night in the US Capitol Building, with a reception hosted by Representative Bruce Vento of Minnesota. All were spellbound by the keynote address of noted environmentalist Dave Foreman, chairman of the Wildlands Project (Tuscon, Arizona) and national board member of the Sierra Club (San Francisco, California). Foreman brought tears to many eyes and brought the entire audience to its feet with applause with his inspiring reminder of why we must protect our natural world.

Saturday was devoted to exploring the politics of the federal Endangered Species Act (ESA) reauthorization, and to discussing proposed alternatives to the present ESA, such as the Endangered Natural Heritage Act (ENHA), which was drafted and supported by a coalition of environmental groups from across the country. Many aspects of the need for comprehensive biodiversity protection were discussed, as, for example, the devastation to ecosystems caused by exotic species. In addition, speakers discussed legal, scientific and political challenges to protecting species on private lands. State roles in both federal and state ESAs and other laws were emphasized as part of the conference's overall effort to promote a paradigm shift in attitudes about the states' ability and responsibility to protect endangered species and ecosystems. How to make this state-federal partnership as effective as possible was discussed at length by all conference participants.

On Sunday the conference featured numerous presentations show-casing the best that the states have to offer in new and innovative programmes to protect biodiversity. Speakers discussed topics including a proposed federal constitutional amendment to protect the natural environment; existing state constitutional provisions; state endangered species acts and the need for a model law; state agency officials' descriptions of exciting examples of what some states can do, and are presently doing, to acquire and protect habitat, conserve private lands, map and analyse habitat and ecosystems, and fund various protection programmes. The importance of citizen enforcement of biodiversity protection laws was discussed, as well as examples of state and federal laws that expressly allow for conduct of law suits by citizens. The politics of state legislatures was a timely and sobering topic, given the current funding and networking of anti-environmental state legislators.

On Monday, conference participants attended a morning workshop designed to instruct them in basic lobbying techniques, both in Congress as well as in state legislatures. Discussions, presentations and role-plays exposed each participant to a host of successful communication methods. In the afternoon, participants practised their new skills by calling on their federal senators and representatives on Capitol Hill. The day concluded with a debriefing on the day's efforts.

All in all, the conference provided a solid and substantial foundation for further understanding, strategizing, discussion and deliberation about both the state and the federal government role in the protection of endangered and other wildlife, and of biodiversity in general in this nation. Participants went away with a new perspective on the

role that the states do and must play in biodiversity protection, as well as with an understanding of the issues and action needed for a new and stronger federal ESA. Feedback from participants has been most gratifying; many feel that they have a better grasp of 'the big picture' of biodiversity protection, as well as of the numerous and complex issues, laws and policies that impact biodiversity in the United States. Many have called for an annual conference on this topic, to further explore and update developments in this area.

Some participants submitted papers or other materials in support of their presentations; those papers are available from Susan George.

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Rio+5 Forum

Held in Rio de Janeiro, Brazil, during 13–19 March 1997

The main goal of this meeting was to evaluate the progress in implementing the accords of the 1992 Earth Summit. It was evident during the meeting that the main sectors of society had not yet managed to come to a satisfactory agreement in regards to sustainable development. Entrepreneurs, multilateral organizations, governments and non-governmental organizations (NGOs) seem to speak different languages when the issue of who is to carry out the treaties signed at the Earth Summit is discussed. Common agreement was only reached in the conclusion that conditions on the planet have worsened over the last five years.

Five hundred representatives of organizations and institutions of several countries participated in forum, including such illustrious names as the President of Brazil, Fernando Henrique Cardoso, James Wolfensohn (World Bank) and Mikhail Gorbachev. The meeting conclusions were sent to the reunion of the Sustainable Development Commission of the United Nations in New York.

More than a revision of the advances and retreats in environmental issues, the Rio+5 Forum served to show that misunderstandings still prevail. Both the World Bank and the private sector, for example, claimed to have contributed most to sustainable development. According to Andrew Steer (World Bank Environment Department), the organization invested US$ 8.5 thousand million in environmental projects in 70 countries over the last five years: 'There is no institution that has been helping more to promote sustainable development' he said. Bjorn Stigson, executive director of the World Business Council for Sustainable Development, a coalition of 120 international enterprises, in turn stated that no sector had changed more on behalf of the environment than industry. He stated that the amount invested by the private sector in developing countries had increased in recent years, while public resources had been reduced. 'Today, about 75% of this sum comes from the private sector' he emphasized.

At the workshop that gathered together Western European NGO representatives, one of the main complaints was the devastation caused by private enterprises. The World Bank also did not escape criticism. According to the State of the World 1997, the annual report of Worldwatch Institute (Washington, DC) 'the World Bank continues to lend large sums for development schemes that add to carbon emissions and destroy natural ecosystems, while the broader vision of a sustainable economy is neglected'.

At the meeting, NGOs and governments showed that it will be some time before they find a common language. Fernando Henrique Cardoso blamed the governments' slowness in implementing sustainable development on bureaucracy and political interests. 'It is not enough to have political intention' he said, during a speech made to participants. But judging by the declarations made by the majority of environmental activists, the governments will once more appear as the bad guys in history.

Maurice Strong (former general secretary of the Earth Summit and chairman of Rio+5) criticized the actions of governments in his opening speech: 'The governments have not managed to implement the necessary measures. Countries all over continue in the no sustainable development direction'. This criticism is supported by the Worldwatch Institute report, which states that governments still pursue economic growth at any price, ignoring the fact that it damages common global environments, such as the atmosphere and the oceans, and could severely disrupt the world's economy.

Research, carried out by the Dutch Institute for Research on Public Expenditure, revealed that the greater part of government subsidies harm the environment. There are more than US$700 thousand million destined yearly to water, agriculture, energy and road transport sectors. The study showed, for example, that 80% of the US$335 thousand million earmarked for agriculture encouraged non-sustainable production.

In fact, the reports presented confirm that the environmental health of the planet has worsened over the last five years. Population increase, loss of biodiversity and atmospheric heating were the most grave problems pointed out. According to the Worldwatch Institute report, since the Earth Summit, the world's population has increased from 5.2 thousand million to almost 5.7 thousand million; tropical forests and other ecosystems have been extinguished wholesale by expanding agriculture and human settlements; three-quarters of the 4600 species of mammals are threatened with extinction; and between 1990 and 1995, the United States increased their carbon gas emissions by 6.2%.

But not all of the news was discouraging. Since the Earth Summit, the world-wide population is more attentive to environmental problems. This was the conclusion from the investigation of the International Environmental Monitor, accomplished with the participation of 25 000 inhabitants of 25 countries.

If no country has yet developed a general plan to take sustainable development forward, this initiative has been taken by town, province and state governments. A survey conducted by the United Nations Commission on Sustainable Development revealed that 1812 local governments in 64 countries are implementing Agenda 21 locally. In their evaluation of what has been done since 1992, the NGOs come out with their morale strengthened. According to Maurice Strong, the NGOs have the merit of having been the principal nucleus of action in the fight for sustainable development.

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The Great Barrier Reef Conference: Science, Use and Management

Held at James Cook University, Townsville, Queensland, Australia, during 25–30 November 1996

This national conference reviewed Great Barrier Reef (GBR) coral reef, and coastal management, scientific findings over the last decade, identified gaps in current knowledge, and provided an improved information base for the management of and decision-making for the Reef as a World Heritage Area. Approximately 240 people attended, mainly coral-reef scientists, natural-resource managers, oceanographers, fisheries scientists and managers, marine-park planners, tourism researchers and industry representatives. Ninety percent of participants were Australian, with a number of delegates from Southeast Asia and the United States.

All key presentations were plenary sessions, which are published as Volume One of the conference proceedings. Approximately 40 short poster papers are also included in the proceedings and are published as Volume Two. The conference was organized into seven main sessions.

The conference was launched by Professor Martyn Forrest (Vice-Chancellor, James Cook University) and Mr Peter McGauran (Australian Minister for Science). Two talks were given during the introduction. One was by Dr Russell Reichelt (Australian Institute of Marine Science, Townsville) entitled 'The 13-year perspective: what we know and don't know', and the other was by Dr Ian McPhail (Great Barrier Reef Marine Park Authority, Townsville) on partnerships and collaboration in management of the GBR World Heritage Area.

Session one dealt with land-use influence and nearshore processes and pressures. The current state of understanding of how much is coming off the land into the marine environment, the principal sources of this material, changes with land-use changes in the catchments, how far the material travels in the GBR lagoon and the effects it has on reefs and lagoon was reviewed.

Session two was entitled 'Pressures and effects on GBR lagoon'. The GBR lagoon, also known as the shipping channel, is 10–50km wide, and separates the main reef tract of the GBR from the inshore reefs, estuaries and wetlands. The lagoon is influenced by runoff and linked by food chains and currents to inshore and offshore regions. It is also the home of soft-bottom communities and the basis of extensive fishing and trawling efforts. The session addressed several aspects of pressure on the lagoon, including the effects of trawl fisheries on GBR seabed habitat.

Session three looked at pressures on reefs, islands and cays, which differs to pressures on the lagoon, as the direct influence of runoff is greatly reduced, and phenomena such as cyclones, crown-of-thorns starfish, upwelling, human visitation and fishing increase. This session looked at the implications for coral communities, seabirds and fish.

Session four was entitled 'Large-scale phenomena and organism response' and recognized the importance of regional and global change, oceanographic processes and the transport of nutrients and sediments by water moving between inshore, lagoonal and outer reef areas. Speakers addressed various topics, including coral bleaching and causes, and consequences of crown-of-thorn starfish outbreaks.

The social, economic and cultural needs of people who visit the GBR and use it for recreational, cultural and commercial activities was addressed in session five. Issues included how science contributes to informed decision-making. The keynote address was entitled 'Science brokering and managing uncertainty'. Other speakers addressed the issues of tourism and GBR economics.

Session six, entitled 'Reef connectedness', focused on the importance of replenishment of populations and biodiversity at reefs and other habitats by transport of larvae and/or juvenile and adults of fishes, corals and other reef biota between reefs.

Managing the GBR World Heritage Area was the topic of the last session. People pressure on the GBR is at a level unprecedented in the GBR's long history and evolution. This session discussed implementation of concepts such as carrying capacity, sustainable use of resources, protection of resilience, and application of precautionary approaches to management.

All keynote papers and short poster papers are published as Volume One and Volume Two of the Proceedings. Limited hard copies of the proceedings are available from the James Cook University library, the Great Barrier Reef Marine Park Authority library, the Australian Institute of Marine Science library and the CRC Reef Research Center secretariat.

The proceedings are also published on the Internet and are available through the Cooperative Research Centre for Ecologically Sustainable Development of the Great Barrier Reef's Web site: http://www.gbrmpa.gov.au/~crcreef under the usual rules of copyright.

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Environment '97 – First International Conference and Trade Fair on Environmental Management and Technologies

Held in Cairo, Egypt, during 16–18 February 1997

The conference and trade fair were organized by EEAA, which is the national authority for the environment in Egypt. Experts and participants from over 25 countries participated in the conference and over 100 companies and authorities participated in the trade fair.

The primary objectives of the conference were to promote the exchange of knowledge and experience, and establish worldwide links in the fields of environmental management and technologies. The technical themes of the conference were organized into four major groups: urban, industry, nature and general issues. An interactive three-day programme of 28 parallel sessions, surveyed strategic tools, state-of-the-art practices and appropriate technologies, and environmental management systems for both developed and developing countries.

A total of 35 papers were presented in the urban sessions, covering air pollution, municipal and sludge wastes, and health care. With air pollution, the research papers presented different approaches for the utilization of natural gas as an alternative to conventional fuel. The

main obstacles to the adoption of natural gas fuel, such as the extensive refueling infrastructure and its commercial applications, were presented. A number of air-quality impacts, including changes in ozone, carbon monoxide, nitric oxide, particulate matter and other toxic compounds and greenhouse gases, were presented. The role of public awareness in combating air pollution was stressed.

Sessions on municipal solid-waste management focused on turning the waste into energy, design and construction considerations for solid-waste dumping, and testing some modern techniques of waste recycling and management. Some papers evaluated the effective techniques for surface sealing and lining systems of landfills which provide cost-effective protection of human health and the environment. Some case studies on co-firing of mixed waste-fuel, waste paper recycling systems and testing some modern techniques of waste recycling and management were presented.

Papers presented on health-care waste (HCW), previously called hospital waste, covered different facets of management, treatment and safety. Risk assessment as regards public health, environmental and occupational safety and health was demonstrated. Proper treatments of hospital and industrial waste were discussed. Different technologies for HCW disposal were described and the processes explained in some papers.

Studies on sludge management demonstrated how the problems of sludge disposal, treatment and conversion can be solved. The stabilization of sewage sludge using cement-kiln dust indicated the possibility of using it as an environmentally-safe fertilizer in agricultural purposes. Studies on the use of biosolids from waste-water treatment plants proved that it can be ideally suited as a soil conditioner and fertilizer in agriculture. Investigations on the use of grasses for the dewatering and conversion of domestic sludge to humus and the reduction of hazardous organic and inorganic compounds proved to be an appropriate method. Other municipal wastewater studies on discharge, treatment and management alternatives were discussed. Computer models were presented to evaluate the wastewater disposal options. Studies on the use of chemicals to enhance the coagulation and flocculation processes in waste-water treatment proved to be effective for upgrading the treatment process. Many case studies on waste-water treatment were presented.

The industry sessions covered five subjects presented in 33 papers. The major topics included hazardous-waste management, air pollution, waste water, soil remediation and pollution control and environmental management systems. The strategic issues related to control and management of industrial hazardous wastes were discussed in case studies from developing and industrial countries. The characteristic problems emerging were described and strategies for facing vital development problems discussed. The control of environmental impacts from hazardous materials produced, stored or disposed in inappropriate fashions, and the management of ongoing sources of wastes were stressed.

Sessions on industrial air pollution discussed the different techniques for the removal of particulate and gaseous contaminants from industrial exhaust streams prior to emission to atmosphere. Technology trends in dust collectors for the steel, cement and other industries were presented. A technological survey of industrial and domestic waste water treatment and management was described. Various operational results were presented and discussed. Different tools for evaluating the influence of industrial waste water on the treatment plants were presented, including waste water characterization, plant optimization and assessment of industrial discharges. Some important biological process techniques for waste water treatment were presented.

A general approach to soil-quality management at industrial sites, and remediation of contaminated soils and ground water was developed and presented by some authors. Soil washing (*ex situ* remediation) and flushing (*in situ* extraction of contaminants) approaches were shown to be effective methods for cleaning contaminated soils. In both approaches, water or chemical additives such as surfactants, acids and solvents are used to promote contaminant removal. Presentations on cleaner production, pollution prevention and environmental management for industrial development, gave examples of how processes are getting cleaner. Studies on the involvement of workers in the planning and implementation of technology and procedures to enhance the efficiency of use of resources have proven successful.

The nature sessions involved 35 papers presented in six main subjects, namely biodiversity and resource management, land resources, surface and ground water resources, marine and coastal zones, environmental monitoring and information systems, and tourism and environment. The first presentation in this track was given by Dr Mostafa K. Tolba (former executive director of UNEP, Nairobi, Kenya) who addressed the kinds of action that have been taken by the international community and by governments to promote the conservation and sustainable use of biological diversity. Discussions organized by Dr M. Kassas (former senior consultant of UNEP and University of Cairo, Giza, Egypt) dealt with the options that must be considered by governments. Some case studies were presented on integrated management plans based on environmental concepts and principles. Recent trends for land resource management and sustainable development were presented. Studies on environmental impact assessment and prevention of contamination of surface and groundwater resources were highlighted.

A general review of coastal-zone management, development and urbanization programmes were presented. Impacts of oil exploration and production, and of marine construction for developmental purposes, were described and discussed. An overview on the use of geographical information systems (GIS) in long-term environmental management was outlined in support of environmental information and monitoring programmes. Eco-tourism challenges, realities and solutions were addressed. Elements for initiation of sustainable eco-tourism were outlined.

The general sessions included 13 papers and some panel discussions covering three major fields (environment and development, environmental education, training and awareness, and energy); each focused on integrated environmental management and protection. Strategies for safeguarding the future field of action for some industries were addressed. The promotion of environmental education, and legislation and training for combating environmental illiteracy were discussed. Topics in the energy session focused on the use of solar energy in some engineering applications, continuous solar spectral distributions, and the impact of air contaminating load on the environment.

The exhibition and trade fair aimed to: bring together manufacturers, customers and equipment users involved in the fields of environmental protection; build alliances between exhibitors and customers; provide businessmen an opportunity for making contacts; and foster the exchange of innovative ideas and technologies amongst suppliers and customers. The fair participants displayed their technologies and products with the aid of audio-visual presentations, posters and prints. The technologies exhibited covered many environmental fields.

(1) Industrial wastewater and sludge. The material covered different mechanical, physical and biological treatments, computer

models, analysis and monitoring instruments, fittings, disinfecting systems, leak detection and prevention technology, renovative methods, and construction systems.

(2) Solid and hazardous waste. The technologies included refuse collection and recycling systems, waste handling, composting plants, landfills, biogas plants, incinerators, packing and transportation, decontamination and decommissioning technology, waste minimization technology, utilization of animal carcasses and farming waste, medical waste handling, industrial hazardous waste management, and hazardous sludge treatment.

(3) Air pollution and noise control. The fair covered filtration systems, exhaust and indoor climate equipment, air cleaning systems, control and monitoring systems, acoustics, noise and vibration control, and vehicle emissions control and testing equipment.

(4) Energy efficiency and renewable energy. The exhibited material included energy-efficient systems, heat-recovery systems, renewable energy technology, control and monitoring systems, computer models and applications, energy co-generation, and waste-to-energy systems.

(5) Coastal zone, marine pollution and natural resource management. The technology in this field covered coastal zone and marine pollution detection, monitoring and mitigation, multidisciplinary field sampling programmes, integrated navigation and survey systems, bioassay techniques, sediment contaminant characterization and remedial action, innovative instrumentation, ocean and sea disposal management and impact assessment, oceanographic data collection and analysis, geophysical surveys, and monitoring of chronic and accidental pollution. The natural resource management technologies included surveying, mapping, integrated pest management, bio-fertilizers, desert reclamation, biodiversity and eco-tourism.

(6) Soil decontamination. Technologies on dewatering systems, and soil cleaning and consolidation by different biological and hydraulic methods, were exhibited.

(7) Environmental information and monitoring systems. The exhibited technology focused on GIS technology applications, satellite imagery and surveillance of different environmental changes.

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Third Conference on Atmospheric Chemistry of the American Meteorological Society

Held at Long Beach, California, USA, during 2–7 February 1997

The Atmospheric Chemistry Conference was attended by 50–100 atmospheric chemists, and was a part of the annual meeting of the American Meteorological Society (AMS), attended by about 1800 professional meteorologists. Several meetings of other speciality areas of the American Meteorological Society were at the same meeting site, and there were joint sessions with meetings on atmospheric radiation, interdisciplinary studies, and measurement technologies. The meeting was attended primarily by atmospheric chemists and meteorologists working on atmospheric chemistry field programmes, modelling studies, and laboratory measurements. Most participants were AMS members, but some (5–10%) European scientists attended.

The meeting consisted of eight speciality sessions, and three joint sessions. There were 67 papers/presentations in total. The session topics/titles were:
(1) Convection and atmospheric chemistry
(2) Heterogeneous chemistry of clouds and aerosols
(3) No_x and ozone photochemistry
(4) Aircraft impacts and SUCCESS results
(5) Atmospheric chemistry change
(6) Chemical and meteorological modelling
(7) Radiation and photolysis: impacts of clouds and aerosols
(8) Surface fluxes: emissions and deposition
Joint: Shortwave radiation transfer
Joint: Atmospheric chemistry and aerosols

A preprints volume (175 pages) is available from the American Meteorological Society, 45 Beacon Street, Boston, MA, 02108–3693, USA (Tel: +1 617–227–2426 extension 246).

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